MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2019/2020

DDS5221 – DISCRETE STRUCTURES

(For DIT/DBIS students only)

7 MARCH 2020
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This examination paper consists of **3** pages.
2. There are 4 structured questions.
3. Write all answers in the **Answer Booklet** provided.

STRUCTURED QUESTIONS (TOTAL: 40 Marks)
Answer all questions and show necessary workings in the answer booklet provided.

QUESTION 1 (10 Marks)

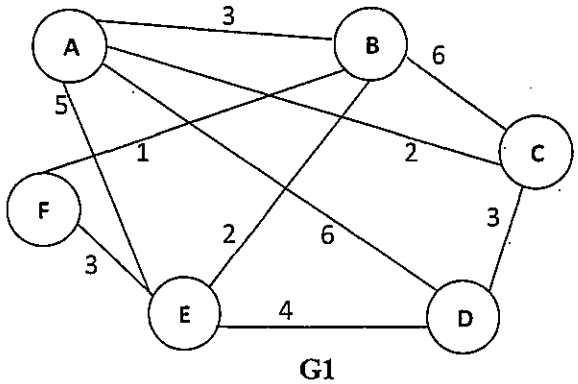
A. Based on the propositions below, ***S*** and ***T***.
$S = (p \vee q) \vee (q \rightarrow r)$
$T = [r \wedge (p \leftrightarrow q)] \rightarrow (q \vee r)$
Construct a truth table and state whether both propositions are logically equivalent. [5 marks]

B. Let $P(x)$ be the propositional function $x < x^2 - 2$. The domain of discourse is the set $= \{x \mid 0 < x < 6\}$. Write each proposition below in words and tell whether each proposition is **TRUE** or **FALSE**.
I. $\exists x P(x)$ [1 mark]
II. $\neg(\exists x P(x))$ [1 mark]

C. Given $X = \{1,3,5,7,9,11\}$ and $Y = \{p,q,r,s,t,u,v\}$ where f is the function from X to Y. Let $f(1) = r$, $f(3) = q$, $f(5) = p$, $f(7) = t$, $f(9) = v$ and $f(11) = u$. Draw its arrow diagram and find its domain and co-domain. Determine if it is injective, surjective and bijective. [3 marks]

QUESTION 2 (10 Marks)

Given weighted graph G1 below;



G1

A. Determine if graph G1, is a complete graph. [1.5 marks]

Continued...

B. Determine if graph G1 has a Hamiltonian path. If exist, write the path. [1 mark]

C. Determine if graph G1 has a Hamiltonian cycle. If exist, write the cycle. [1 mark]

D. Prove that graph G1, is a planar graph by indicating the number of faces, vertices and edges. Draw the new planar graph G1. [2.5 marks]

E. By using the Prim algorithm, draw a sequence of diagram to determine the minimum spanning tree from the weighted graph G1. Indicate the total minimum weight. Choose vertex D as the chosen starting vertex. [4 marks]

QUESTION 3 (10 Marks)

A. Construct circuits to produce the following output.

$$(a \oplus b)' \wedge (a'bd)' \wedge (a' \vee d)$$ [4 marks]

B. Draw the Karnaugh Map for the optimal Boolean expression below and write the minimized expression.

$$mn' \vee op'mn' \vee nm'p' \vee o' \vee pn \vee m \vee pon'm \vee n'o'p$$

[6 marks]

Continued...

QUESTION 4 (10 Marks)

A. Draw the transition diagram of the finite state automaton (I, S, f, A, S_1).

$I = \{p, q, r\}$, $S = \{S_0, S_1, S_2, S_3, S_4\}$, $A = \{S_0, S_3, S_2\}$

[6 marks]

	f		
I / S	p	q	r
S_0	S_2	S_4	S_1
S_1	S_2	S_0	S_3
S_2	S_4	S_0	S_2
S_3	S_1	S_0	S_3
S_4	S_3	S_2	S_4

I. Determine whether the given string is accepted by the transition diagram that you have drawn:
   a. rqprpqqrp [0.5 mark]
   b. qqrprpqrp [0.5 mark]

II. Redraw the transition diagram that you have drawn as the transition diagram of a finite state machine. [3 marks]

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